



SENECA FIRE ENGINEERING, LLC

SUMMARY ANALYSIS REPORT

SPRINKLER SYSTEM FLOW ALARM FAILURE

**DOUGLAS M. SMITH/PRODUCTION
CONSULTANTS AND EQUIPMENT
2235 DEFOOR HILLS ROAD, NW
ATLANTA, GEORGIA 30318**

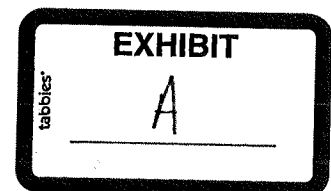
Prepared by:

Daniel L. Arnold, P.E., FSFPE
Seneca Fire Engineering, LLC
1205 Johnson Ferry Road
Suite 136-400
Marietta, GA 30068

Submitted to:

Mr. David Bessho, Esq.
Mr. Albert Dugan, Esq.
Cozen & O'Conner
SunTrust Plaza, Suite 2200
303 Peachtree Street
Atlanta, Georgia 30308

September 10, 2010



SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 1 of 16
September 10, 2010

Introduction

On December 21, 2008, a fire was discovered at the Douglas Smith Production Consultants and Equipment (PC&E) facility located at 2235 DeFoor Hills Road in Atlanta, Georgia. PC&E provides film, video and theatrical support and equipment services. The PC&E facility includes soundstages and related production facilities that are available for rental. The subject fire occurred in Soundstage No. 1.

Fire origin and cause investigator A. W. Durham, IAAI-CFI determined that the fire in PC&E Soundstage No. 1 started on the south wall and the ceiling of the space and was caused by theatrical pyrotechnic devices that were used during a December 19, 2008 video production shoot. He concluded that cellulosic insulation installed on the soundstage walls and ceiling was ignited by exploding pyrotechnic devices that had malfunctioned during this video production.

The fire(s) in Soundstage No. 1 were effectively controlled by water that discharged from automatic sprinklers installed at the ceiling of the soundstage. However, there was no alarm transmitted to the building's alarm monitoring service indicating the sprinkler water flow as intended. As a result, rather than receiving prompt and automatic notification of sprinkler system activation, the first indication of the fire and the resulting water flow from the fire sprinklers did not occur until approximately 7:55 a.m. when a passerby noticed a bell ringing on the outside of the building and notified PC&E.

PC&E employee Mark Davis received notice of the ringing bell by telephone and responded to the premises to investigate. At about the same time, while viewing a security video feed from the premises' security system on his home computer, PC&E employee Mark Wofford separately noticed what appeared to be a haze in the building. He also responded. Upon their arrival, they discovered the operating sprinklers, smoke and extensive water throughout the premises and remnants of the fires in Soundstage No. 1 that had been mostly extinguished by the automatic sprinkler system. They notified the fire department by a 911 telephone call.

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 2 of 16
September 10, 2010

The City of Atlanta Fire Department (AFD) received the 911 call at approximately 9:00 a.m. and AFD Engine No. 8 responded. Upon their arrival, Engine No. 8 reported the fire under control and several inches of water in the building. The water from the open sprinklers had washed out the slab under Soundstage No. 1 and spread throughout the PC&E facility beyond Soundstage No. 1.

Installed during the 1970's, the fire sprinklers at PC&E were supplied by two wet pipe system risers that were located in a closet near the soundstages. Each wet pipe system riser included a circa-1970, Model 153 alarm valve and Model A-2 retarding chamber manufactured by Automatic Sprinkler Corporation of America (ASCOA). Each retarding chamber was separately piped to an electric water flow transmitter/pressure switch (Potter Model WFTRA, circa-1976.) In addition, the retarding chambers were piped in combination to the single, water-powered bell or gong that was discovered to be ringing by the passerby.

At the time of the fire, the pressure switches were connected to a combination Fire/Burglar panel that was installed and monitored by Ackerman Security. These switches were intended to provide prompt and automatic notice of a fire condition by responding to water flow through the sprinkler system. These alarm pressure switches were wired in parallel to 'Zone 1' of the Fire/Burglar panel; one of two fire-related alarm zones. The other, 'Zone 2' on the panel, was wired to valve tamper switches installed on the sprinkler riser control valves. All other devices connected to and monitored by the installed panel were security-related devices such as door contacts, motion detector and keypads. There were no smoke or heat detectors connected to the panel.

Fire alarms from the Fire/Burglar panel were programmed to automatically transmit off-site to Ackerman who monitored the system 24 hours a day via connected telephone lines. When water flowed through the sprinkler system, the pressure switches were to activate and a fire alarm generated and transmitted to Ackerman who would immediately notify the fire department to respond. However, Ackerman did not receive a fire alarm signal from the water flow through the sprinkler system during the fire. As a result, rather than the fire department being notified

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 3 of 16
September 10, 2010

promptly as intended, the fire and related sprinkler water flow was not discovered until the sounding water motor gong was noticed by a passerby.

Seneca Fire Engineering, LLC was retained to review the circumstances of the subject fire focusing on determining the factors that caused or contributed to the failure of the installed water flow pressure switches and/or the connected Ackerman Fire/Burglar panel to provide automatic notification of the sprinkler system water flow as intended. This report has been prepared to summarize the results of that review to date and related opinions.

In preparing this report, I have reviewed certain available information including reports, photographs, manuals, rules, regulations, codes and standards, product literature, depositions, exhibits and other material. A substantive list of the materials reviewed and relied upon is provided in Appendix A.

A visual examination of the installed sprinkler system and Fire/Burglar panel was conducted on January 9, 2009. On February 20, 2009, joint inspection and field testing of the pressure switches and then installed Ackerman control panel was conducted. At that time, the pressure switches were removed for a further joint laboratory examination which was conducted on April 21, 2009. On July 27, 2009, a joint examination/test was conducted of the Ackerman Fire/Burglar panel that was installed at the premises at the time of the fire.

The conclusions and opinions expressed in this report are based on my knowledge, education and experience in fire protection engineering, fire suppression systems, fire detection and alarm system and related codes, standards and practices and currently available information. A resume further describing my training and experience and a listing of prior testimony is provided as Appendix B. If additional or different information becomes available, the opinions herein are subject to change or may be supplemented.

Discussion/Opinions

Summary of Examinations and Tests

As indicated above, examinations and tests were conducted in an attempt to determine the cause for the lack of notification of sprinkler system water flow to the monitoring service. These examinations and tests included:

- Operational field testing of the installed pressure switches conducted on February 20, 2009.
- In-situ testing of the Fire/Burglar panel installed after the loss, actual field circuitry and alarm/telephone transmission capabilities conducted on February 20, 2009.
- Laboratory examination and testing of the pressure switches conducted on April 21, 2009.
- Functional testing of the Fire/Burglar panel that was installed on the day of the fire conducted on July 27, 2009.

These examinations and tests revealed the following:

- During flow testing, neither pressure switch created an alarm on Zone 1 of the then installed Fire/Burglar panel. As a result, there was no off-site notification of the water flow.
- Notwithstanding the above, when manually tested, the Zone 1 circuit of the then installed Fire/Burglar panel functioned properly including the actual field wiring and off-site alarm/telephone transmission and notification.
- During subsequent laboratory examination of the switches, Pressure Switch No. 2 did not operate at pressures up to 50 psi; Pressure Switch No. 1 operated at approximately 8 psi.
- During laboratory testing of the Fire/Burglar panel installed at the time of the fire, Zone 1 functioned entirely properly including alarm/telephone transmission capability.

Additionally, a review of the available Alarm History Report and panel programming data for the Fire/Burglar panel installed at the time of the fire (i.e. Ackerman) revealed that both the

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 5 of 16
September 10, 2010

alarm panel and its communication path with the monitoring station was functional during all relevant times.

Based on the above testing and examinations performed and a review of related documents and testimony, it is my opinion to a reasonable degree of certainty that a failure of the installed pressure switch was the reason no water flow alarm (i.e. Zone 1) was received by the Ackerman monitoring service on the day of the fire. As a result of the pressure switch failure, the fire and related water flow in Soundstage No. 1 was not discovered until much later when the sounding exterior water motor gong was observed by a passerby.

Sprinkler System Testing

The Rules and Regulations of the Georgia Fire Safety Commissioner (Chapter 120-3-3-.04) prescribes the state's minimum fire safety standards which include NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems*, as amended. NFPA 25 outlines the minimum requirements for the periodic inspection, testing and maintenance of wet pipe sprinkler systems including required annual inspections and tests. NFPA 25 establishes "minimum inspection, testing and maintenance methods" for such tests and inspections. The 2002 edition of NFPA 25 edition was adopted (as amended) at the time of the PC&E fire.

The Georgia Fire Sprinkler Act (Chapter 120-3-19) establishes the minimum requirements for persons who design, install, inspect, etc., fire sprinkler systems in Georgia. These requirements address issues such as personnel training, experience and licensing for persons performing such work.

Interior Fire Protection, Inc (Interior) provided the annual inspections of the sprinkler systems at PC&E. The annual inspection conducted prior to the fire at PC&E was on January 2, 2008 by Mr. Marvin Grindle of Interior. At the time of the January 2, 2008 inspection, Mr. Grindle's apprentice license to conduct such inspections had expired. In a June 7, 2010 letter, Assistant

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 6 of 16
September 10, 2010

State Fire Marshal Dwayne Garriss indicated that had his office received the necessary documents (such as Mr. Grindle's NICET II certification), an inspector's license would have been issued in 2008 based on a waiver. Mr. Grindle first met the full requirements for licensure (NICET III) under Chapter 120-3-19 in 2010.

The following information is provided in the report related to Mr. Grindle's January 2, 2008 inspection of the PC&E sprinkler systems.

" ...

5C. Are Alarm valves, water flow indicators, and retard chambers in satisfactory condition? (Answer: YES)

8B. Is electric alarm test satisfactory? (Answer: YES)

" ... "

Additionally, the green inspection tag placed by Mr. Grindle on the wet pipe system risers during the January 2, 2008 inspection was annotated with the following

"Did Alarms Operate? Answer: Yes water motor"

At the time of the January 2, 2008 inspection by Interior, the pressure switches were monitored by Sonitrol via a different alarm panel. A review of the Alarm History Report from Sonitrol for January 2, 2008 and related panel programming data for the panel revealed the following:

- Alarm signals and Restoral signals (i.e. resets) for both the pressure switches (i.e. Alarm Zone 1/ waterflow) and the valve tamper switches (Alarm Zone 2/water cutoff) were configured for transmission to the Sonitrol monitoring station 24 hours a day.
- The Sonitrol panel was functioning and capable of transmitting its signals to the monitoring station on January 2, 2008 as evidenced by the proper transmission and receipt of 'arming' and 'disarming' code for both system partitions on that day both before and after Mr. Grindle's testing .
- Both Alarm Zone 1 (pressure switches/ "waterflow") and Alarm Zone 2 (tamper/ "water cutoff") on the Sonitrol panel were configured to sound the alarm system keypads. There

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 7 of 16
September 10, 2010

were no additional fire alarm horns, strobes, flashing lights, smoke detectors, heat detectors installed or required.

- The Sonitrol keypads were programmed to sound continuously for 5 minutes from an alarm unless reset using the appropriate access and user code. The keypads could not 'resound' from a subsequent alarms on the same zone pressure switch activation (i.e. Zone 1) unless the initiating switch and the alarm panel/keypad had been reset (i.e. Restored)
- Notwithstanding the above, there were no Alarm signals (Alarm Zone 1/waterflow), Supervisory signals (Alarm Zone 2/water cutoff) or Restoral signals ever received by Sonitrol during the testing of the sprinkler system by Mr. Grindle on January 2, 2008.

When a sprinkler system is being actively worked on or tested, the associated monitoring station is typically contacted and instructed to disregard any alarms received while the work is ongoing. Referred to as "placing the system on test," this is done to prevent an unwanted fire or police department response. When an alarm system is 'placed on test', event signals are still transmitted to and received by the monitoring station. However, the operator simply disregards any signals received until informed that the work/testing is complete or until the designated 'on-test' time expires. On January 2, 2008, the PC&E alarm system was 'placed on test' at 10:51:43 EST for the Interior inspection and taken off test at 11:21:40; a time span of 30 minutes. There were no water flow alarms received by Sonitrol during this time.

During his July 29th, 2010 deposition, Mr. Grindle testified that he specifically recalled confirming the electric alarms (i.e. pressure switches) were operational and in satisfactory condition during his January 2, 2008 inspection. He based his determination on hearing the keypad that was located in the front lobby of the building sound (and stop sounding) three times. He testified that he did not look at the keypad nor review the alarm panel's display information to confirm receipt of the appropriate alarm.

Further, Mr. Grindle did not confirm receipt of a fire alarm at the monitoring service (Sonitrol). Relying solely on the unconfirmed audible signal from a keypad is not a sufficiently reliable confirmation that sprinkler systems' electric alarms (i.e. pressure switches) were operating satisfactorily (if at all) during the January 2, 2008 testing based on the test procedure described.

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 8 of 16
September 10, 2010

Lastly, Mr. Grindle's recollection of his testing procedure and observations made related to the keypad sounding, testing sequence, etc. as he described in his deposition is inconsistent with the information contained in the Alarm History Report from that day and the related Sonitrol panel programming data for the panel previously described.

Based on the above, it is my opinion to a reasonable degree of certainty that, notwithstanding indications otherwise on the related Interior inspection report, the sprinkler system electric alarms (i.e. pressure switches) were likely not functioning properly during the January 2, 2008 fire sprinkler inspection by Mr. Grindle and were not properly discovered and repaired.

NFPA 25

As indicated above, NFPA 25 outlines the minimum requirements for the periodic inspection, testing and maintenance of wet pipe sprinkler systems including the requirements for annual inspections and tests. The purpose of NFPA 25 as outlined in Section 1-2 is to "*provide requirements that ensure a reasonable degree of protection for life and property from fire through minimum inspection, testing and maintenance methods...*" In the explanatory material (Annex A), it further states that "*history has shown that the performance reliability... under fire-related conditions increases where comprehensive inspection, testing and maintenance procedures are enforced. Diligence during an inspection is important...*"

Annex B of NFPA 25 provides information concerning the forms that need to be completed with respect to inspections and tests of water-based fire protection systems. The Annex information outlines that the forms used should be complete and comprehensive since such systems are comprised of many components. Example forms are provided. One such sample form demonstrates the testing of water flow alarm devices is intended to include confirming that the alarm supervisory company received the signal properly. As noted above, Mr. Grindle did not confirm receipt of a fire alarm signal by the monitoring service (Sonitrol) during his January 2, 2008 inspection and none was received. Had he done so, he would have discovered that the

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 9 of 16
September 10, 2010

electric alarms were, in fact, not functioning properly at that time and needed to be replaced or repaired. Since the pressure switches were monitored by a Remote Supervising Station (NFPA 72), there was no requirement for the use of audible or visible notification at the premises; only at the supervising station.

Based on the above, it is my opinion that Interior's failure to confirm receipt of the sprinkler system's electric alarms by Sonitrol during the January 2, 2008 inspection or inform PC&E that the testing performed was not a complete testing of connected electric alarms was negligent and not in conformance with the intent and requirements of NFPA 25. Due to Interior's negligent inspection, the faulty pressure switches were not discovered, repaired or replaced. As a result, the pressure switch was still installed, did not operate during the fire and was the direct cause of any increased damage created by the resulting delay in fire department notification and intervention.

Water Discharge

As noted above, the cumulative quantity of water that discharged from the PC&E sprinkler system due to the controlled fire in Soundstage No. 1 reportedly spread throughout the facility and washed out the slab under the soundstage. This excessive water was directly created by the lack of prompt fire department notification due to the failure of the pressure switch to operate as discussed above.

As part of my review, I was asked to provide a general estimate the quantity of water that would have discharged from the sprinkler system had the fire department received prompt notice of the water flow in the sprinkler system as intended. To develop this estimate, the following conditions were assumed:

- Fire department notification is initiated upon operation of a single sprinkler as required.
- The response time of the fire department would be similar to the actual event (7 min.)
- The initial sprinkler operating pressure was a standard sprinkler at approximately 115 psi.

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 10 of 16
September 10, 2010

- The alarm receipt and dispatch time was approximately 3 minutes

Based on the above, it is reasonable to assume that the fire department would be present at the premises and intervening within 15 minutes of initial sprinkler operation. Assuming a single sprinkler was operating at up to 60 gallons per minute for approximately 15 minutes, the total quantity of water discharge would be nearly 900 gallons.

For visualization purposes, if assumed to spread out level over the entire concrete floor of Soundstage No. 1 (9,400 sq. ft.) without flowing out of the space through doors or other paths, 900 gallons of water would cover the floor to a depth of less than 5/32-inch. If even more water was assumed from say four sprinklers flowing or if the fire department did not intervene for an hour, the total depth of water (again, if entirely contained to a level soundstage floor) would accumulate to only 5/8-inch.

Considering the above, it is very likely that the quantity of water that discharged from the sprinkler system could have been either limited to or managed by the fire department to within the soundstage area and would not have resulted in the extent of water damage reported. Further, prompt response and salvage operations by the fire department may also have reduced the smoke spread and resulting damage caused by the fire beyond the area of the soundstage.

If any opinion expressed changes as a result of additional information, this report may be changed or supplemented as appropriate.

Prepared by:



Daniel L. Arnold, P.E.

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 11 of 16
September 10, 2010

Appendix A

Documents Reviewed

1. Deposition transcripts and exhibits
 - William Grindle
 - Charles Brundage
 - Adam Pickett
 - Randy Nappier
 - Jane Smick
 - Rick Lambert
 - Thomas Monroe
2. Ackerman and Sonitrol Documents
3. Rules and Regulations of the Georgia Fire Safety Commissioner
4. NFPA Codes and Standards
 - NFPA 25, Inspection, Testing and Maintenance of Water-Based Fire Prot. Sys.
 - NFPA 72, National Fire Alarm Code
5. Reports prepared by:
 - Durham Fire Investigations
 - Fire Science and Technology
 - John R. Steinberg, M.D.
 - Atlanta Fire Department
6. Various manufacturer's technical product data information and manuals
7. Answers to Interrogatories and Request for Production
8. Other various photographs, field notes, documents, etc.

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 12 of 16
September 10, 2010

Appendix B

DANIEL L. ARNOLD, P.E., FSFPE

EDUCATION: **University of Maryland**
Bachelor of Science in Fire Protection Engineering, 1980

**PROFESSIONAL
EXPERIENCE:**

2001 - Present **SENECA FIRE ENGINEERING, LLC**, Marietta, GA
Principal Fire Protection Engineer

Consulting fire protection engineer. Fire protection system design and evaluation. Building, fire and life safety code analysis, equivalencies and negotiations. Property fire protection condition surveys and audits. Fire investigation and litigation/expert support services.

1985 – 2001 **ROLF JENSEN & ASSOCIATES, INC.**, Atlanta, GA
Engineering Manager/Vice President

Design, evaluation and consulting fire protection engineering projects. Conceptual planning, design in inspection of fire protection systems including sprinkler, water supply, standpipe, fire alarm, detection and alarm systems. Consult on building code issues related to fire and life safety.

1983 – 1985 **BECHTEL CORPORATION**, Gaithersburg, MD
Fire Protection Engineer

Consulting engineer in areas of fire protection and mechanical engineering. Implemented fire protection requirements. Performed fire hazard analyses including ensuring compliance with regulatory requirements, postulating fire scenarios and the evaluation of general plant fire safety. Developed conceptual fire protection system design and reviewed existing systems for modifications.

1982 – 1983 **ROTHFUSS ENGINEERING CORPORATION**
Staff Fire Protection Engineer

Performed fire protection system surveys including as-built system walk downs, acceptance tests, preparing operation and technical procedures, fire brigade training and fire pre-plan development. Designed fire protection systems including detailed drawing development, water supply system modifications and specifications.

SUMMARY ANALYSIS REPORT
 SPRINKLER SYSTEM FLOW ALARM SYSTEM
 PRODUCTION CONSULTANTS/EQUIPMENT

Page 13 of 16
 September 10, 2010

1980 – 1982

BECHTEL CORPORATION, Gaithersburg, MD
 Systems Engineer

Designed and specified fire protection systems including automatic sprinklers, fire pumps, water spray and deluge systems, standpipes, halon and fire alarm detection systems. Provided technical guidelines in areas of fire barrier design including walls, floors/ceiling assemblies, fire doors, dampers and penetration seals as well as egress design and general life safety issues.

1980

UNIVERSITY OF MARYLAND, Fire Protection Department
 Student Research Assistant

Involved in the expansion of the U.S. Fire Administration's Programmed Planning Guide. Participated in the development of the final reports submitted to the USFA.

1974 – 1985

PRINCE GEORGES COUNTY, MD
 Firefighter

Active volunteer firefighter in large combination department obtaining rank of Lieutenant. Emergency apparatus operator including mobile fire pumps and aerial ladders. Duties included commanding units and personnel and training volunteer recruits.

PROFESSIONAL
AFFILIATIONS:

National Society of Professional Engineers, Member
 American Council of Engineering Companies, Member
 National Fire Protection Association, Member
 Georgia Fire Inspector's Association
 Society of Fire Protection Engineers, Fellow
 Southeastern Chapter, Executive Committee
 Southeastern Chapter, Past President
 International Code Council (ICC)

REGISTRATION:

Professional Engineer

Delaware	Tennessee	Indiana	Arkansas
Florida	North Carolina	Ohio	Virginia
Georgia	South Carolina	Texas	
Alabama	Pennsylvania	Mississippi	

SUMMARY ANALYSIS REPORT
SPRINKLER SYSTEM FLOW ALARM SYSTEM
PRODUCTION CONSULTANTS/EQUIPMENT

Page 14 of 16
September 10, 2010

COMMITTEE

MEMBERSHIPS:

NFPA 13, Technical Committee on Automatic Sprinkler System, Installation Criteria, Alternate Member (Former)

NFPA 92A, Technical Committee on Smoke Management Systems, Principal Member (Former)

Society of Fire Protection Engineers, Southeastern Chapter, Past President and Executive Committee

Commission on Fire Safety and Preparedness,
U.S. Department of Energy

SELECTED SEMINARS & SPECIAL COURSES ATTENDED:

“Basic and Intermediate Fire Fighting, Maryland Fire and Rescue Institute.

“Foam Systems Seminar,” National Foam.

“Construction Scheduling Seminar,” Maryland Society of Professional Engineers.

“Fire Protection for Power Plants,” Bechtel Power Corporation.”

“Enclosure Fire Hazard Analysis,” Fire Protection Engineering Dept., Univ. of Maryland.

“Flashover Seminar”, Society of Fire Protection Engineers.

SELECTED TECHNICAL PAPERS, PUBLICATIONS AND SPEECHES:

“Computer Support System for the Programmed Planning Guide,” United States Fire Administration, Watts, Arnold and Milke, 1981.

“Emerging Technology and Fire Protection,” Atlanta, Georgia, April 1991.

“Sprinklers and Glazing,” Society of Fire Protection Engineers, Southeastern Chapter, 1991.

“Fire Protection Systems Piping,” *Piping Handbook*, 6th Edition, 1992.

“Failure of a Sprinkler System: A Case Study,” *Fire Protection Engineering*, Issue No. 21, Winter 2004.

“Suppression System Failures: Case Studies,” Fire Safety Conference, SFPE Greater Atlanta Chapter, 2005, 2010.

SUMMARY ANALYSIS REPORT
 SPRINKLER SYSTEM FLOW ALARM SYSTEM
 PRODUCTION CONSULTANTS/EQUIPMENT

Page 15 of 16
 September 10, 2010

<u>Action</u>	<u>Location</u>
1. Eugene V. Fife and Lu Ann L. Fife v. Kiawah Island Utility, Inc., Kiawah Resort Associates, L/P. d/b/a Kiawah Resort Associates	Charleston, SC
2. Waretex Industries, LTD., et al. v. Town & Country, et al. State of South Carolina, County of Greenwood	Greenville, SC
3. Marc P. Malcuit, et al., v. SMD, Inc., et al. Circuit Court of Warren County, Kentucky	Warren Co., KY
4. ConAgra, Inc., v. Wilson Foods Corporation, Doscocil Companies, Inc., Normac Foods, Inc., and Thompson Builders of Marshall, Inc.;	Overland Park, KS
5. Revman Industries, Inc. v. Montgomery Industries, Inc., et al. Court of Common Pleas, Spartanburg Co., S.C.	Spartanburg, SC
6. Empire Distributors, Inc., et al v. Heaven Hills Distilleries, Inc. Jefferson Circuit Court, Division Two Jefferson County, Kentucky	Louisville, KY
7. Davis, as Administrator v. Pittway Corporation et. al. Dillard et al. v. Pittway Corporation et. al. Circuit Court of Etowah County, Alabama	Etowah Co., AL
8. Selig Enterprises, Inc. v. ADT Security Services, Inc.; Mid-Atlantic Security v. Stimsonite; U.S.D.C., N.D. Ga.,	Atlanta, GA
9. Lowe's Home Centers, Inc. v. Olin Corporation U.S.D.C., M.D. Ga.,	Albany, GA
10. Federal Insurance Company a/s/o Keystone Foods Corporation, v. Cagles, Inc; U.S.D.C., N.D. Ga.,	Atlanta, GA
11. Central Synagogue; Wausau Business Ins. Co. v. Turner Construction Co., Aris Development, et al.	New York, NY
12. Pretzel's, Inc vs. Shambaugh & Sons, Inc., et al. State of Indiana, Wells Superior Court	Bluffton, IN
13. Darshin and Sandeep Kakaria v. Goodwin, Lamb, etc. Fifth Circuit Court for Davidson County, TN at Nashville	Nashville, TN
14. Mayflower Seafood Restaurant III, LLC vs. Whaley Food Service Repair, Superior Court for Rockingham County, S.C.	Madison, SC
15. Colonial Properties v. Lowder Construction Company State Court of Bibb County, Georgia	Macon, GA
16. Lam Lee Group v. Fire Power Systems, Inc. and Scott & Reid General Contractors, District Court, Dallas County, TX	Dallas, TX
17. Latoya Smalls v. Bread and Roses Hospitality, Inc, et. al. Circuit Court of the 10 th Judicial Circuit, Jefferson County, AL	Birmingham, AL
18. Bristol Brass & Copper, Inc. v. AppServ, Inc., et. al. U.S.D.C., Eastern District of Tennessee at Greenville	Bristol, TN
19. Tennessee Hotel Associates v. R.H. Sinclair Co., et al. Circuit Court for Blount County, Tennessee	Memphis, TN
20. Kimberly-Clark Corporation v. APL Logistics, et al.	Atlanta, GA

SUMMARY ANALYSIS REPORT
 SPRINKLER SYSTEM FLOW ALARM SYSTEM
 PRODUCTION CONSULTANTS/EQUIPMENT

Page 16 of 16
 September 10, 2010

	Northern District of Georgia, Atlanta Division	
21.	Colonial Properties v. Lowder Construction Co., et al. State Court of Bibb County, Georgia	Macon, GA
22.	Winter Construction Co. v. Safeway Fire Protection Co. Northern District of Georgia, Atlanta Division	Atlanta, GA
23.	Creative Fabricators, LLC v. S&S Sprinkler Co. LLC Eastern District, State of Louisiana	Mobile, LA
24.	Associated Grocers v. Americold, NPIC, et al. District Court of Wyandotte County, Kansas	Kansas, City, KS
25.	Hardware Imagination v. Tech-AeroFoam Products Circuit Court of 9 th District, Orange County, FL	Tampa, FL
26.	Rock Tenn v. Commercial Piping, Metrolina Sprinkler, et al. Superior Court, Union County, North Carolina	Charlotte, NC
27.	Sterling Group v. Underwood Fire Equipment Company Circuit Court of Wayne County, Michigan	Detroit, MI
28.	Deere & Company v. Factory Mutual Ins. Co., et al. District Court, 7 th Judicial District, Scott County, Iowa	Atlanta, GA Davenport, IA
29.	Mt. Hawley and James River v. Pallet Consultants Corp. District Court, Southern District of Florida	Miami, FL
30.	Allstate Insurance Company v. Nationwide Sales, Inc. Shonda Harper and Joseph L. Wright	Walton County, FL
31.	Ruby Tuesday, Inc. of Griffin, GA v. M&B Exhaust Services, LLC	Spaulding Co., GA
32.	AGF Springcreek Coit II v. Metro Fire Protection 44 th District County of Dallas County, Texas	Dallas County, TX
33.	Camden County v. Integrated Systems, Inc. and AFEX US District Court, Southern District of GA, Brunswick District	Camden Co., GA
34.	Target Medical, Inc., Double B Investments v. Gold Dust, Inc. Circuit Court of Tennessee, 30 th Judicial District at Memphis	Memphis, TN
35.	Delta Mills, Inc. v. Picanol N.V. and IH Services, Inc. Court of Common Pleas, Greenville, NC	Charlotte, NC
36.	Wayne Farms, et al. v. Crane Company, et al. Superior Court of Fulton County, Georgia	Gainesville, GA
37.	Cincinnati Insurance a/s/o Mid-South v. CMW, Inc., et al. 27 th Judicial District, Jackson County Circuit County	Annville, KY
38.	Hutchison v. McLaughlin Custom Builders v. RSI, Woodman Insulation Co., Inc. and Tip Top Roofers Service Corp State Court of Fulton County, Georgia	Roswell, GA
40.	Nappy's of Florida, Inc. and FCCI Commercial Insurance Co. v. Gator Fire Extinguisher Company, Inc. 8 th Judicial Circuit, Alachua County, Florida	Gainesville, FL
41.	Weyerhaeuser Co. LTD v. Magic Welding, ARON Services, G&M Heating and Plumbing, et al. Court of Queen's Bench of Alberta, Judicial District of Grand Prairie	Edmonton, AB